

WHAT IS CLAIMED IS:

1. A temperature difference drive unit, comprising:

a power generator driven by mechanical energy to generate electric power;
and

5 a mechanical energy generator for generating the mechanical energy supplied to the power generator, the mechanical energy generator comprising

a thermal converter including a phase change material, the volume of which changes based on temperature at least in a temperature range in which the phase change material is in a solid-liquid phase, whereby the change in volume of the phase change material and the thermal converter is converted into the mechanical energy for driving the power generator.

2. The temperature difference drive unit according to claim 1, wherein the phase change material is a mixture of compounds having different solid-liquid phase change temperature ranges, wherein the mixture ratio of the compounds is adjusted based on the environmental conditions in which the temperature difference drive unit is used to achieve desired operating characteristics.

3. The temperature difference drive unit according to claim 1, wherein the thermal converter further includes an additive for adjusting the solid-liquid phase change temperature range or volume-expanding characteristics of the phase change material.

4. The temperature difference drive unit according to claim 2, wherein the thermal converter further includes an additive for adjusting the solid-liquid phase change temperature range or volume-expanding characteristics of at least one of the compounds.

5. The temperature difference drive unit according to claim 1, wherein the volume of the phase change material changes substantially linearly over at least the temperature range in which the phase change material is in a solid-liquid phase.

6. The temperature difference drive unit according to claim 5, wherein the change in volume between a low temperature and a high temperature is greater than a predetermined amount.

5 7. The temperature difference drive unit according to claim 2, wherein the volume of the phase change material changes substantially linearly over at least the temperature range in which the phase change material is in a solid-liquid phase.

8. The temperature difference drive unit according to claim 7, wherein the change in volume between a low temperature and a high temperature is greater than a predetermined amount.

10 9. The temperature difference drive unit according to claim 1, wherein the mechanical energy generator includes a case in which the thermal converter is contained, and a reciprocally movable drive member that is driven by the volume change of the thermal converter.

15 10. The temperature difference drive unit according to claim 1, further comprising a gear train having a plurality of gear wheels to transfer the mechanical energy to the power generator.

11. The temperature difference drive unit according to claim 10, wherein the speed increasing ratio of the gear train is adjustable to achieve a desired power-generating efficiency.

20 12. The temperature difference drive unit according to claim 1, further comprising a mechanical energy accumulator for accumulating the mechanical energy generated by the mechanical energy generator.

13. The temperature difference drive unit according to claim 12, further comprising:

an elastic body for accumulating the mechanical energy generated by the mechanical energy generator, the elastic body being elastically deformed by a volume change of the thermal converter; and

5 an elastic body controller for maintaining a displacement of the elastic body caused by the mechanical energy generator until the displacement of the elastic body reaches a predetermined value, and for releasing the displacement of the elastic body when the displacement of the elastic body exceeds the predetermined value.

10 14. The temperature difference drive unit according to claim 12, further comprising:

an elastic body for accumulating the mechanical energy generated by the mechanical energy generator, the elastic body being elastically deformed by a volume change of the thermal converter; and

15 an elastic body release for maintaining a displacement of the elastic body caused by the mechanical energy generator, and for manually releasing the displacement of the elastic body.

15. A temperature difference drive unit, comprising:

a mechanical energy converter for converting thermal energy obtained by change in ambient temperature into mechanical energy;

20 a mechanical energy accumulator for accumulating the mechanical energy outputted by the mechanical energy converter;

a rotor rotated by the mechanical energy;

a power generator for generating an electric power in response to rotation of the rotor;

25 a transfer unit for transferring the drive force of the rotating rotor to the power generator; and

a controller, operated by the electric power from the power generator, for controlling the speed of the rotor.

16. The temperature difference drive unit according to claim 15, wherein the mechanical energy accumulator comprises an elastic body adapted to be elastically deformed by the mechanical energy.

17. The temperature difference drive unit according to claim 15, wherein the speed of the rotor is controlled by adjusting an electric current flowing to the controller to brake the rotor by an electric magnetic brake.

18. The temperature difference drive unit according to claim 15, wherein the transfer unit is a gear train comprised of a plurality of gear wheels, at least one of which includes an index for indicating time.

19. An electric device, comprising:

a mechanical energy converter for converting thermal energy obtained by change in ambient temperature into mechanical energy;

a mechanical energy accumulator for accumulating the mechanical energy outputted by the mechanical energy converter;

a rotor rotated by the mechanical energy;

a power generator for generating an electric power in response to rotation of the rotor;

a transfer unit for transferring the drive force of the rotating rotor to the power generator;

a controller, operated by the electric power from the power generator, for controlling the speed of the rotor; and

a time display rotatably driven by the mechanical energy together with the power generator and controlled by the controller.

20. A timepiece, comprising:

a mechanical energy generator, for generating mechanical energy by change in ambient temperature, comprising a thermal converter including a phase change

material, the volume of which changes based on temperature at least in a temperature range in which the phase change material is in a solid-liquid phase; and

5 a power generator driven by the mechanical energy generated by the mechanical energy generator to generate an electric power;

wherein the timepiece is driven by the electric power generated by the power generator.

21. An electrical appliance, comprising:

10 a mechanical energy generator, for generating mechanical energy by change in ambient temperature, comprising a thermal converter including a phase change material, the volume of which changes based on temperature at least in a temperature range in which the phase change material is in a solid-liquid phase; and

15 a power generator driven by the mechanical energy generated by the mechanical energy generator to generate an electric power;

wherein the light electrical appliance is driven by the electric power generated by the power generator.